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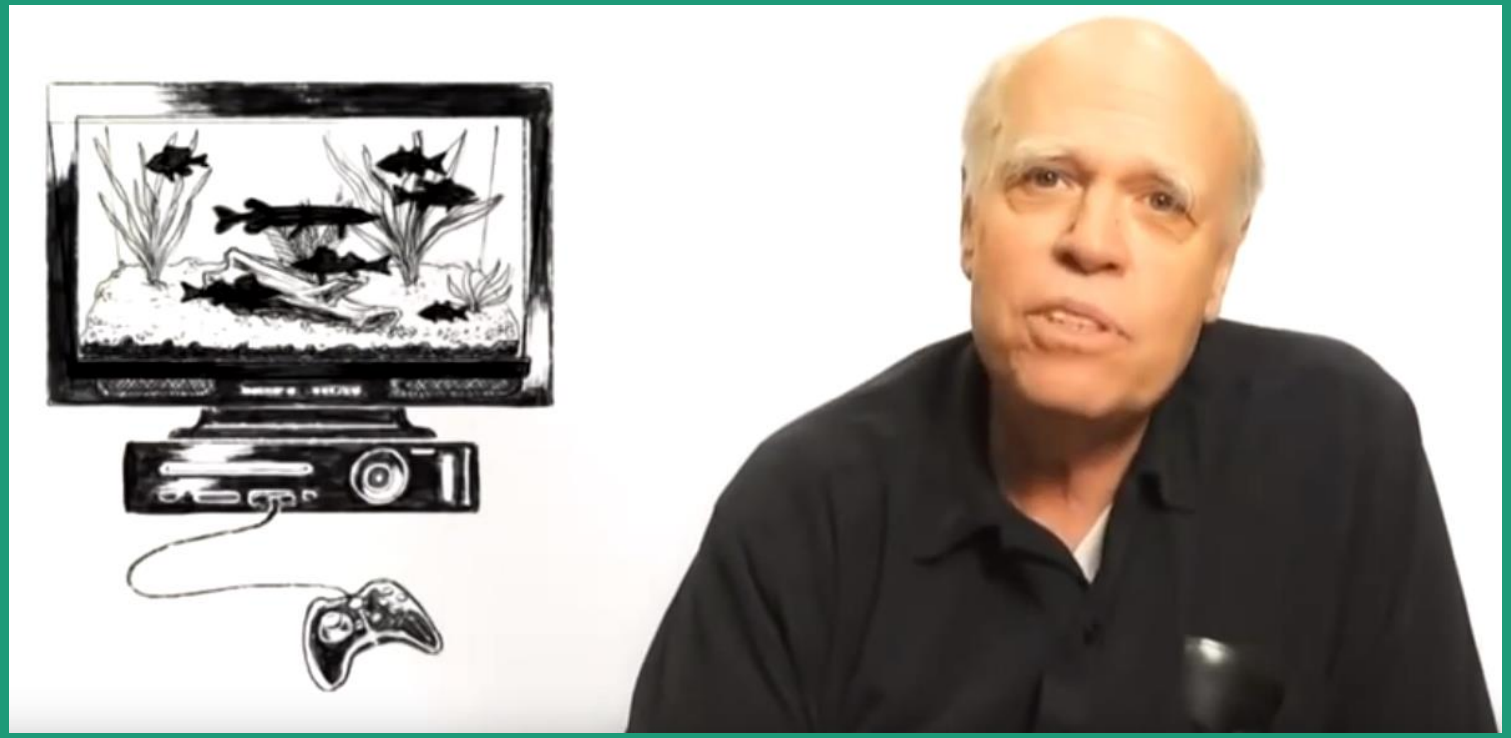
Good Learning and Good Games

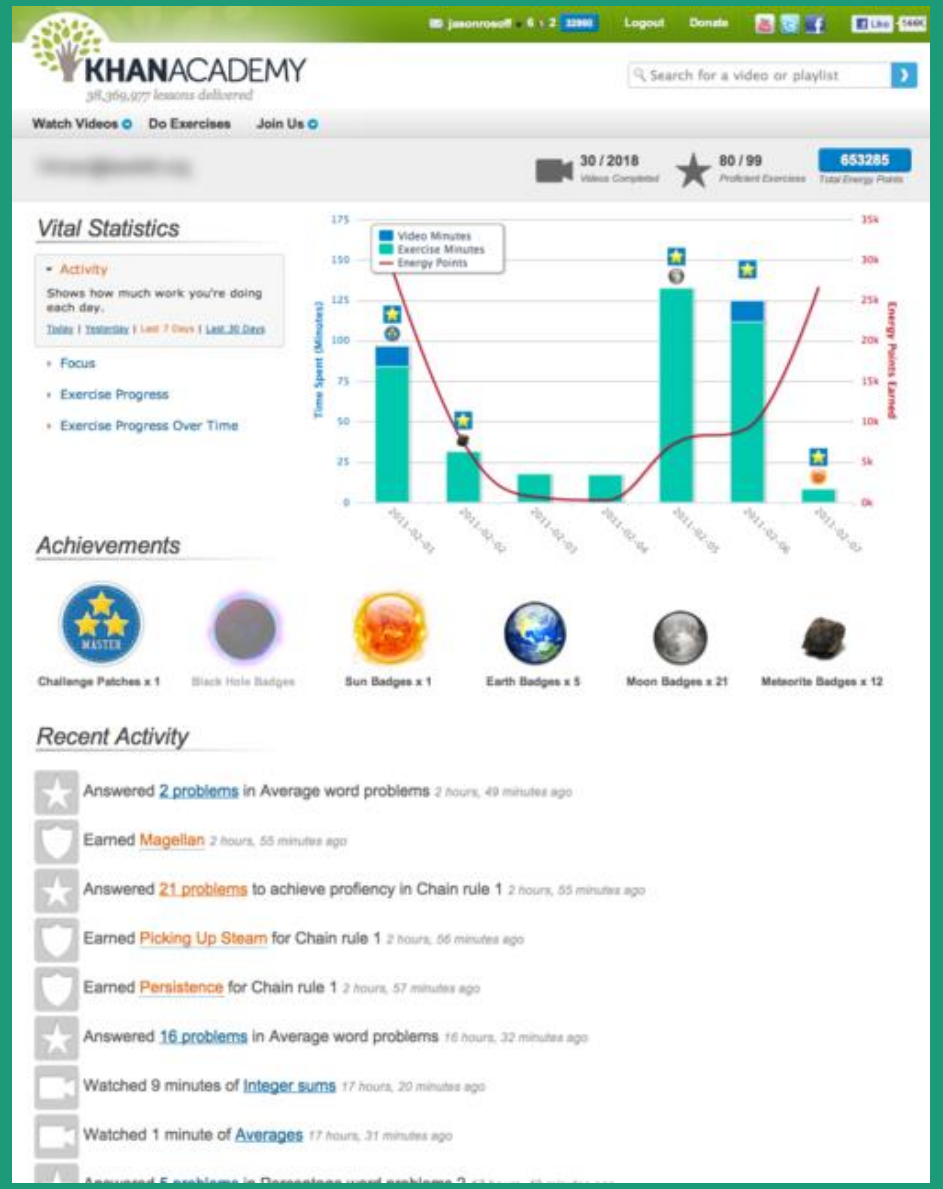
James Paul Gee's Principles on Gaming



Well-Ordered

Teaching students how to solve problems starts with good sequencing of the problem. The human mind is ripe for creativity, however, setting up an environment where problem solving is random leads a student nowhere. In a game, each level is designed to set the player up for success in the following levels. According to Gee: Early problems set the player up for later success. Let's take classic Mario game for example. The first level is always the easiest. The principles of the game are introduced, the basic controls of the game are learned, and with each new level, the player is introduced with something new about the game to be utilized in future levels.

This principle jumps out at me because it is the best way for students to learn mathematics. In the classroom, the sequence of topics taught are similar to the level up process of a game. The first unit involves review of previous math knowledge, and the following units involve introducing a few new concepts that complement a student's existing knowledge. The final units of math incorporate everything learned in the course and often involves applying this knowledge to new situations. A well known organization that is already gamifying mathematics in this manner is Khan Academy.

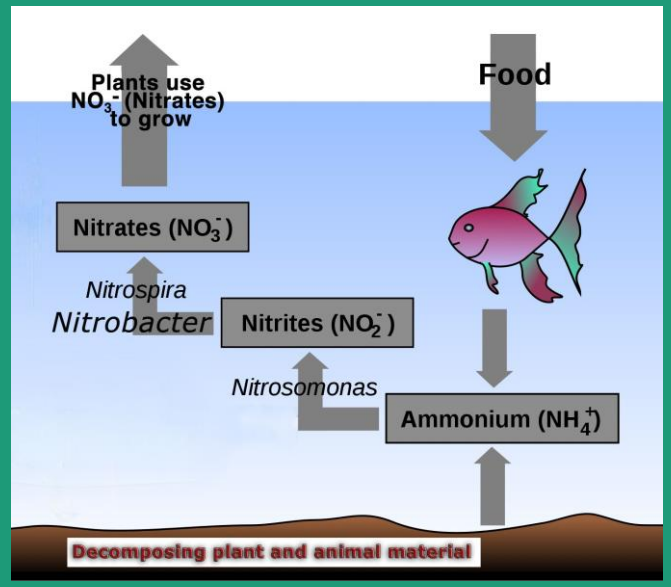


Fish Tank

Solving hard problems is interesting but by default most hard problems are complex. Teachers should put some elements of complexity into a “fish tank” where the students see some aspects of complex concepts first. Games integrate this in levels. The first few levels of a game are “fish tank” levels in that they do not present to the player the full array of the game. Doing so would be overwhelming. Instead a view variables are introduced at the beginning to be eased into a complex system of the game.

This principle caught my attention because teaching math and science is a very complex juggling act. Presenting all the information randomly and all at once will leave the student overwhelmed and confused. Instead science teachers must find ways to “fish tank” the information so that by the end of the lesson or unit they comprehend the complexity of the concept.

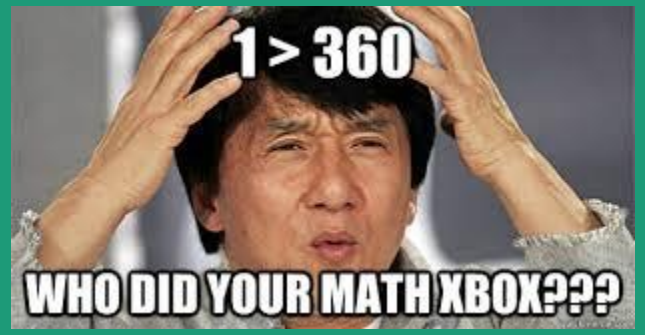
In my practice, this is very important when teaching atomic theory. The atom is so complex, and when you consider different elements and compounds it becomes infinitely more complicated. But if you present students with bits of key aspects of the atom at different times, then students are able to slowly paint a complex picture of the atom in their minds.



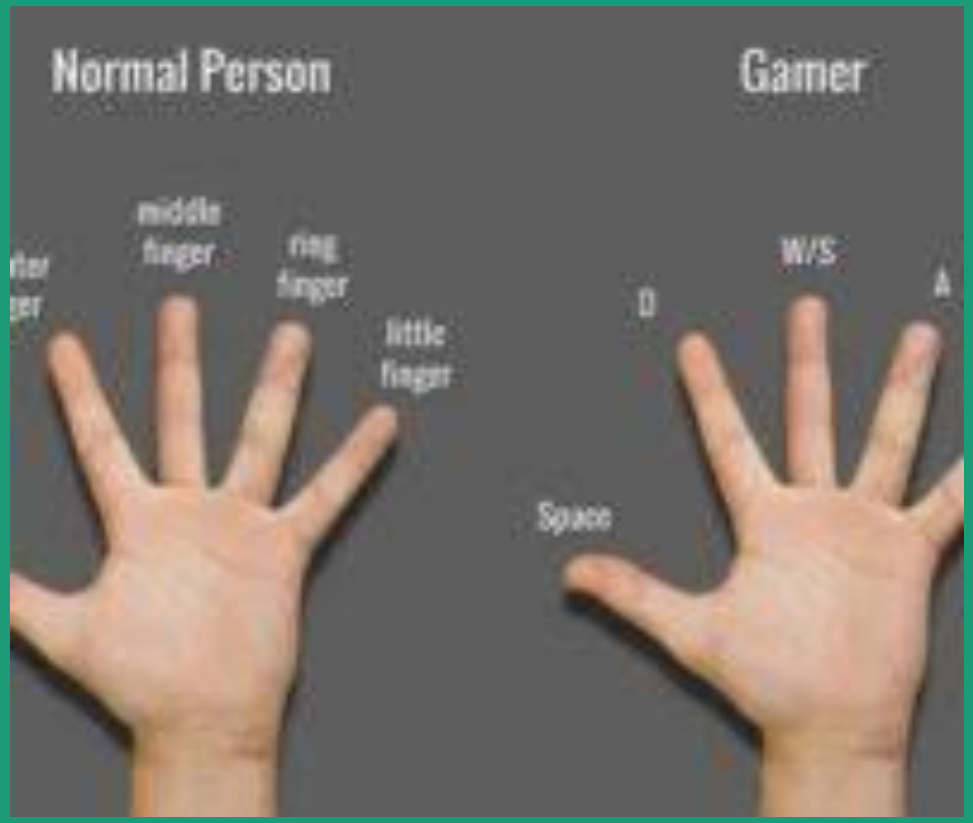
Skills Under Strategy

To get good at anything, one must master basic skills. But skill and drill is often boring and students aren't always clear on why they're doing it. To combat this, Gee suggests teachers take skills and put them under a strategy. The teacher must demonstrate to students that they are solving a problem or accomplishing a goal, and to do so, they must gain the requisite skills for the task. Gee emphasizes that the focus is on the goal and getting your strategy to accomplish your goal to work. In the end, the student gains basic skills and they will know how to integrate them to accomplish specific tasks.

This principle is especially important to me as a physics teacher. The goal of physics is to describe and measure physical phenomena. But words only get you so far in physics. Students must understand that core math skills are essential for learning physics. For example, when students first learn algebra, they often become frustrated with the fact that teachers are making them integrate letters with numbers. They don't see the point, other then to isolate variables. But in physics, when you demonstrate to students that isolating that variable means describing velocity, force, or energy they then realize the goal of such rote learning. To take it a step further, if they realize that they can create neat machines and devices with that physics knowledge, then starting with the basics of mathematics becomes a rewarding and purposeful task.



Want to learn some terms?



Gamification

Gamification is a concept of adding game elements to a non-gaming environment (Marti-Parreno et al., 2016). When elements of gaming are integrated in a classroom in an authentic manner, the classroom can become a living functioning game. A game like Classcraft leverages positive social behaviors in the classroom. In this game, students create a character on a team, and earn experience points related to positive class behavior. Positive behaviors include helping other students with school work or producing exceptional projects. Like most video games, there are consequences when playing the game incorrectly. In Classcraft, students lose points for behaviors that do not align with the desired learning environment.

In the past, I have used Kahoot to gamify my science classroom. I play the game at the beginning of class to quiz students on the previous days work. Students are awarded points for answering questions correctly and quickly. The more students understand and learn the material, the more points they will get (and candies too).

Game-based learning

In contrast to gamification, game-based learning is the use of games to aid students in the learning experience (Marti-Parreno et al., 2016). A popular example growing up for me was playing Cross Country Canada. In the game, I drove a delivery truck to pick up and deliver commodities to the cities assigned, and made decisions regarding the route, fuel amounts, accommodation for the journey, and when to eat. I only every played this game in elementary school, but I remember so vividly learning how to read maps and gaining an understanding of provinces and major cities in Canada.

An example of how G.P Vanier Secondary uses game-based learning in our school is through a game called SMARTSTOCKS for business 11/12 students. The game teaches you how the stock market works and how students can minimize risks on investments. Students can invest fake money and see real life gains and losses with their investment.

Serious Game

A serious game is designed for a clear educational purpose and not purely for entertainment (Laamarti et al., 2014). These games are designed to enhance knowledge acquisition through challenges, situations, and problems to put learning into practice.

An example of a Serious Game I've seen my grade 11's and 12's play is "Parking Mania". It is a driving game where students control a small car and practice parking skills. For each level, students have 5 lives to park their car in a designated spot. In each level, there are gold coins that students must collect, and they are usually in difficult spots, so careful planning and driving technique is important. Students either play this game to practice the concept of parking prior to taking their "N" test or wanting to practice parking in a low stakes environment.

Simulation Game

Simulations games are designed to closely mimic real life events (Laamarti et al., 2016). The purpose of simulation games is to promote training and developing problem solving skills with minimal real life consequences. The are no firm goals in the game, rather the student has the ability to freely control their environment

I could see myself using Steam's dissection software in the future. The virtual reality frog dissection software is a hands-on dissection game that users can experience through the power of virtual reality. This true to life experience covers each step that a student would take if they were dissecting a real frog in their classroom. Along the way, a hologram of national runner-up Teacher of the Year, Wendy Martin, will pop up to provide instruction and challenge students to learn basic anatomy of the frog.

Commercial Off-The-Shelf Games

While there are games designed for educational purposes, commercial off-the-shelf (COTS) games are designed purely for entertainment (Becker and Gopin, 2016). Despite being created for entertainment, COTS have been shown to have educational value too. Some games like The Sims, Civilization, and Portal are viewed as educational games despite commercial success. When it comes to using COTS games in the classroom, acceptance is outweighed by skepticism. Acceptance is focused on serious games where the educational purpose of the game is clear.

In my Physics classroom I could see myself using Mario Kart to teach kinematics, circular motion, and momentum. Prior to racing, players must choose a character and vehicle. The player must keep in mind the weight of the player and vehicle, the max speed, and the skill (which essentially dictates turning radius). The weight of the player allows for greater momentum during collisions. The acceleration dictates speed of a straight path, but is then challenged by turns (circular motion). Projectile motion and force can be calculated by throwing shells and other items.

References

Martí-Parreño, J., Méndez-Ibáñez, E., & Alonso-Arroyo, A. (2016). The use of gamification in education: a bibliometric and text mining analysis. *Journal of Computer Assisted Learning*, *32*(6), 663–676. https://doi.org/10.1111/jcal.12161

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